FLOOR PANEL, ITS LAYING AND MANUFACTURING METHODS

This application claims the benefit under 35 USC 119(e) of U.S. provisional application No. 60/438,777 filed on 9 January 2003.

This invention relates to a floor covering and a floor panel for forming such floor covering. Furthermore, the present invention also relates to methods for laying and manufacturing such floor panels.

In particular, the invention is intended for being applied with floor panels with a layered structure, however, in general it can also be applied with other floor panels.

By floor panels with a layered structure, in the first place traditional laminated panels are meant, which, as known, comprise at least one core layer and a top layer, whereby the core layer, for example, consists of MDF, HDF, particle board, so-called compact laminate or the like, whereas the top layer, for example, consists of different sheets of material pressed on top of each other, such as paper layers soaked in resin, amongst which a printed decorative layer. However, floor panels with another layered structure are not excluded, whereby, for example, the top layer consists of cork, veneer, a relatively thick layer of wood, and so on.

It is known that when installing massive parquetry, different patterns can be formed by means of the composing

wooden floor parts. Hereby, it is also known to make use of relatively small strips which are provided on the subfloor according to a so-called herringbone pattern. Realizing a parquetry floor with a herringbone pattern of massive wooden strips, however, shows various disadvantages. For example, the manufacture of such small, very precisely finished strips is time-consuming. Moreover, the installation of massive parquetry in a herringbone pattern requires a good knowledge of the art. As a consequence, such parquetry is rather expensive.

It is also known that massive parquetry can be imitated by using rectangular floor panels upon which a parquetry pattern is represented, which floor panels simply can be provided on the subfloor in rows. Possibly, also a herringbone pattern might be represented on such floor panels. A disadvantage thereof is that, when the obtained floor panels are installed, seams are created which are very noticeable because they extend transversely through the actual composing parts of the herringbone pattern, which is experienced as very annoying and renders a very artificial impression.

The present invention aims at a floor covering whereby said disadvantages are excluded.

To this aim, it relates to a floor covering of the type consisting of hard floor panels which are made of a plate material, whether multi-layered or consisting of several parts or not, and which, at least at a number of sides, are provided with coupling parts, with the characteristic that the floor panels are configured such that, in joined

condition, they represent a herringbone pattern, whereby the sides of the floor panels coincide with transition edges of the herringbone pattern. As the sides of the floor panels themselves coincide with transition edges of the herringbone pattern, the disadvantage of annoying seams is excluded. Also, such floor panels, as they are made of a plate material, can be realized as a mass product in a simple manner, at an economically advantageous cost price. Moreover, due to the presence of coupling means, the floor panels are easy to install.

Preferably, the floor panels are provided with coupling parts on all sides. More particularly, it is preferred that these coupling parts are configured such that they provide for a locking in vertical as well as horizontal directions on all sides of the floor panels. By "vertical direction", hereby a direction perpendicular to the plane of the floor covering is meant. By "horizontal direction", hereby a direction perpendicular to the respective coupled sides of two floor panels and parallel to the plane of the floor covering is meant.

According to a preferred form of embodiment, use shall be made of at least two series of different floor panels, as a result of which advantageous coupling possibilities are created, which also open a broad range of possibilities for realizing different variants. Hereby, the floor panels of one of said two series preferably form those parts of the herringbone pattern which extend in a first characteristic direction thereof, whereas the floor panels of the second series then preferably form those parts of

the herringbone pattern which extend in the second characteristic direction.

In the most preferred form of embodiment, each floor panel coincides with one part of the herringbone pattern, more particularly with one strip thereof. The upper side of such floor panel then preferably shows one continuous wood pattern extending over the entire surface of the floor panel, which is obtained either by a wood imitation, or by real wood, for example, in the form of veneer.

According to a variant, each floor panel also may coincide with a multiple of strip-shaped parts of the herringbone pattern.

Preferably, the floor panels of the invention are provided with coupling parts which mutually lock the floor panels free of play, preferably with a pretension. Examples of coupling parts which lock free of play as well as allow for a locking with a pretension, are known, for example, from WO 97/47834. Other forms of coupling parts allowing a locking free of play, whether with pretension or not, are of course also possible.

In particular when relatively small floor panels are used for realizing a herringbone pattern, the use of coupling parts performing a locking free of play, possibly combined with a pretension, is very important, as then, when joining the floor panels, these latter automatically will settle in the right position. As a result, a herringbone pattern can be realized without having any knowledge of the art, without the risk of having cumulating deviations.

Thus, this also allows to make the floor panels relatively small, without any risk of problems occurring when those floor panels are installed. Preferably, the floor panels then also are made as strip-shaped parts, whereby the longest sides of the floor panels are shorter than 50 cm, and both longest sides are situated at a distance from each other which is smaller than 15 cm.

Of course, larger embodiments are not excluded.

Preferably, the floor panels and the coupling parts are realized in one piece, from a plate, said plate having a multi-layered structure or not.

Of course, the invention also relates to a floor panel which is configured such that therewith, in combination with other floor panels, whether of another shape or not, a floor covering according to the invention can be realized. Further, the invention also relates to methods for laying and manufacturing floor panels for realizing a herringbone pattern, as will be explained in the following detailed description. Further, the invention also relates to sets of flooring panels packaged in a special manner, as will become clear from the detailed description too.

With the intention of better showing the characteristics of the invention, hereafter, as an example without any limitative character, several preferred forms of embodiment are described, with reference to the accompanying drawings, wherein:

Figure 1 represents a part of a floor covering according to the invention;
figures 2 and 3 represent coupling parts which can be used in the floor panels of figure 1;
figures 4 and 5 represent variants of the coupling parts of figures 2 and 3;
figures 6 and 7 represent further variants of the coupling parts of figures 2 and 3;
figures 8 to 13 represent six variants of a floor covering according to the invention;
figures 14 to 17 represent some further variants of the invention;
figures 18 and 19 represent two methods of manufacturing according to the invention.

As represented in figure 1, the floor covering 1 of the invention consists of hard floor panels 2-3 which, at least at a number of sides, in this case, at all four sides, 4-5-6-7 and 8-9-10-11, respectively, are provided with coupling parts, 12-13-14-15 and 16-17-18-19, respectively. Hereby, the floor panels 2-3 are configured such that, in joined condition, they represent a herringbone pattern, whereby the sides 4 to 11 of the floor panels 2-3 coincide with transition edges or peripheral lines of the herringbone pattern.

Preferably, said coupling parts 12 to 19 are configured such that they perform at all sides of the floor panels 2-3 a locking in vertical as well as horizontal directions. Such coupling parts are known in themselves in different forms, and hereby coupling parts can be concerned which allow a joining of the floor panels 2-3 according to

different possibilities, for example, by shifting the floor panels 2-3 towards each other, whereby these coupling parts engage into each other by means of a snap-effect, by turning the floor panels 2-3 into each other or by joining them vertically. In the following, a non-restrictive number of possible forms of embodiment of coupling parts will be illustrated by means of figures 2 to 7.

In the example of figure 1, two series of different floor panels, floor panels 2 and floor panels 3, respectively, are applied. These floor panels 2-3 are oblong and, in installed condition, they each are situated with their short sides against the long sides of an adjoining floor panel.

As schematically indicated in figure 1, the floor panels 2, at their opposed long sides 4-5, respectively are provided with first coupling parts 12 and second coupling parts 13, whereas, at their opposed short sides 6-7, they are provided with third coupling parts 14 and fourth coupling parts 15. At their opposed long sides 8-9, the floor panels 3 are provided with first coupling parts 16 and second coupling parts 17, respectively, whereas, at their opposed short sides 10-11, they are provided with third coupling parts 18 and fourth coupling parts 19.

The coupling parts 12 and 13 are complementary to each other. Also, the coupling parts 16 and 17 are complementary to each other. Further, the coupling parts 14 are complementary to the coupling parts 17 and the coupling parts 15 are complementary to the coupling parts

16. Also, the coupling parts 19 are complementary to the coupling parts 13 and the coupling parts 18 are complementary to the coupling parts 12.

By "complementary" is meant that they can cooperate with each other. However, to this end, the complementary coupling parts do not necessarily have to have perfectly complementary forms.

The coupling parts 12, 14, 16 and 19 can have, for example, a shape as represented in figure 2, whereas the coupling parts 13, 15, 17 and 18 then have a shape as represented in figure 3.

Figures 4 and 5 represent another example of coupling parts, which can be used instead of those of figures 2 and 3.

As represented in figures 2 to 5, preferably use shall be made of coupling parts in the form of a tongue 20 and a groove 21 with locking parts 22 and 23, which offer a locking in horizontal direction.

Other possibilities, however, are not excluded, as becomes clear from the variant illustrated in figures 6 and 7.

The above-said makes clear that all combinations of using different coupling parts at different sides of the panels are possible, as long as they allow that the panels can be joined in herringbone pattern. However, in a preferred form of embodiment, the coupling parts at the long sides will be of such a nature that they can be coupled to

adjacent panels by means of shifting the panels towards each other and/or by angling them in, whereas the coupling parts at the short sides are of such a nature that the panels can be coupled to adjacent panels be means of shifting the panels towards each other. In another preferred form of embodiment, the coupling parts at the long sides will be of such a nature that the panels can be coupled to adjacent panels by means of shifting the panels towards each other and/or by angling them into each other, whereas the coupling parts at the short sides are of a nature as shown in figures 6 and 7, in other words, are of the type that allows that the short side can be engaged with the long side of the corresponding adjacent panel by means of a dropping-in movement.

In general, it can be an advantage that the coupling parts at one or more sides of the panel are of the type that allows a coupling by a downward movement, more particularly a dropping-in movement, irrespective the type of coupling parts applied at the remaining sides.

In the embodiment of figure 1, the floor panels 2-3 are rectangular, which allows for a smooth manufacturing with little waste. However, this does not exclude that the floor panels 2-3 may have the shape of a parallelogram, as illustrated in figure 8. Figure 8 also shows that the coupling parts in the form of a tongue and a groove also can be arranged in another manner at the periphery than in the embodiment of figure 1.

In figure 9, a form of embodiment is represented wherein the floor panels 2-3 are realized in the form of a parallelogram, however, these floor panels 2-3 are also configured such that in installed condition, the floor panels 2 form two rows 24, whereas the floor panels 3 form rows 25, whereby these rows 24 and 25 are separated by means of parallel separation lines 26-27.

In the example of figure 9, the floor panels 2-3 are oblong, and the floor panels 2 adjoin with their short sides 6 and 7 against the short sides 11 and 10 of the surrounding floor panels 3.

The floor panels 2 of figure 9 have first coupling parts 12 and second coupling parts 13 which are complementary to each other. The floor panels 3, too, have first coupling parts 16 and second coupling parts 17 which are complementary to each other. Further, the floor panels 2 have third coupling parts 14 and fourth coupling parts 15 at their short sides, said coupling parts being complementary to fourth coupling parts 19 and third coupling parts 18 which are situated at the floor panels 3.

In this case, too, coupling means can be applied of the type, as, for example, represented in figures 2-3, figures 4-5 or figures 6-7.

In figure 10, a variant of the embodiment of figure 9 is represented, whereby the floor panels 2 and 3 are identical to each other in respect to shape and coupling parts, whereby they also have the shape of an equilateral

parallelogram. Depending on the pattern one wants to apply on the upper side of the floor panels 2-3, it is no longer necessary to produce two different floor panels 2-3.

Preferably, each floor panel 2, 3, respectively, coincides with one part of the traditional herringbone pattern. This means that on each floor panel 2, 3, respectively, one continuous wood pattern shall be shown, in other words, that each floor panel imitates or represents only one strip of the herringbone pattern.

Figure 11 represents a variant whereby, on one floor panel 2-3, each time two parts 28 of the herringbone pattern are represented, in other words, two so-called strips of the herringbone pattern. Figure 11 also shows that it is possible to thereby realize the floor panels 2-3 such that they can be joined into each other in a staggered manner without disturbing the herringbone pattern.

Figures 12 and 13 represent another two variants whereby each floor panel 2-3 coincides with a multiple of strip-shaped parts 28 of the herringbone pattern.

When laying the floor panels 2-3, according to the invention different methods can be applied. A practical method consists in that, as indicated in several of the figures, the floor panels 2 and 3 are installed row per row, more particularly by laying alternately a row of floor panels 2 according to arrow A and a row of floor panels 3 according to arrow B. Each floor panel to be laid can, for example, be shifted or turned with its long side

into the preceding floor panel, after which it is coupled at one short side to an adjacent floor panel by shifting.

Preferably, the floor panels 2-3 shall be realized from larger plates, which are sawn to form floor panels 2-3, whereby subsequently the respective coupling parts are provided at the edges, for example, are milled out of the material of the plate applied.

In figures 2 to 7, a traditional construction, consisting of a core 29 of MDF, HDF, particle board or the like is represented, said construction being provided with a top layer 30 and a backing layer 31. The top layer 30 consists of several layers of paper soaked in resin or the like, amongst which a printed decorative layer. Of course, the invention is not restricted to floor panels 2-3 with such construction.

E.g., the core may consist of another material, for example, so-called engineered wood, and/or the top layer 30 may consist of only one resin-based layer, or even another material, which is applied directly or indirectly to the core. The core may also be composed of different layers, in which layers may be included for particular purposes, such as for sound-dampening.

Figure 14 shows an important alternative which differs from the previously described embodiments in that not each of both pairs of opposite sides or edges comprises complementary coupling parts. In fact, according to the embodiment of figure 14, both floor panels 2-3 each show one pair of opposite sides, in this case the short sides

6-7, 10-11, respectively, comprising similar coupling parts 14-15 and 18-19, whereas the remaining pair of opposite sides 4-5 and 8-9 preferably is provided with complementary coupling parts 12-13 and 16-17.

This means that, as shown in figure 14, each type of floor panel 2 and 3 comprises coupling parts 13-14-15, 17-18-19 of the same type at three successive sides, whereas the fourth side is provided with a coupling part 12, 16, respectively, of the complementary type. However, the coupling parts 13-14-15 at the three successive sides of the floor panel 2 of the first type are complementary to the coupling parts 17-18-19 at the three successive sides of the floor panel 3 of the second type.

Figure 15 shows an embodiment of a floor covering similar to the one in figure 14, however, with the difference that the opposite sides having non-complementary coupling parts now are formed by the long sides 4-5 and 8-9.

The embodiments of figures 14 and 15 show some interesting advantages over the previous embodiments, especially when the panels 2-3 are provided with coupling parts which, at one or more edges, provide in a vertical and horizontal interlocking. Due to the fact that mechanical coupling parts are provided, the installation of the panels 2-3 requires less experience than with normal tongue and groove panels which have to be glued together, resulting in that such panels increasingly are installed by less experienced people and DIYs. In case of floor panels 2-3 to be installed in herringbone pattern, an additional problem has to be overcome, namely that it is not easy to

compose the pattern, as for each panel location, the right type of panel 2 or 3 has to be used. As in the previously described embodiments, e.g. of figure 1, both types of floor panels 2-3 are of the same form and dimension and both have pairs of opposite edges with complementary coupling parts, it is quite difficult for a person with less experience to distinguish both types of panels from one another. On the contrary, by means of coupling parts arranged in the manner as e.g. in the embodiments of figures 14 and 15, the panels can be distinguished at first sight due to the fact that one type of panel, for example, comprises three tongue-like coupling parts and only one groove-like coupling part, whereas the other type of panel then comprises three groove-like coupling parts and only one tongue-like coupling part.

Another advantage consists in that, when the surface of the panels of each series shows a different appearance, for example, surfaces with a dark colour and a light colour, or with different colours, special effects can be created as shown in figures 14 and 15. Figure 14 shows that complete rows of herringbone patterns, i.e. one row of panels 2 and an adjacent row of panels 3, can be realized, which rows of patterns alternately are of different colours. Figure 15 shows that by means of panels 2 and 3 of different appearance, successive zigzag rows can be created. Of course, also more than two series of panels, each series having panels of different appearance, can be applied to create further special effects.

A further advantage consists in the fact that the panels 2-3 of figures 14-15 can be installed in a somewhat

different manner in respect to the panels of, for example, figure 1, which in certain cases may simplify the method of laying. In figure 14, first one complete herringbone pattern may be installed, for example, of the first colour, after which the subsequent complete herringbone pattern of the second colour is installed. This method of the invention has the advantage that a complete herringbone pattern can be created without having to switch from one series of panels to the other. In the embodiment of figure 15, first a complete zigzag row of panels 2 can be installed, after which a second zigzag row of panels 3 is installed, and so on. Of course, these methods are not limited to panels 2 and 3 with surfaces having a different appearance.

It is clear that floor panels 2-3 according to the invention can also be installed in groups, which groups are arranged according to a herringbone pattern, for example, two by two, as shown in figure 16.

Further, it is also clear that the panels 2-3 of the invention at each of their edges or sides preferably are provided with only one type of coupling part, as this allows a smooth production, this contrary to embodiments in which for example a portion of one edge is provided with a tongue-like coupling part, whereas the remainder of the same edge is provided with a groove-like coupling part, as disclosed in WO 98/38401.

In a particular embodiment, the dimensions of the floor panels allowing to form a herringbone pattern, more particularly the ratio between length and width of the

panels, will be chosen such that the same panels can be used to form other patterns, preferably of the type as shown in figure 17. Herein the length-width ratio is an integer, which preferably is "5".

It is clear that the panels 2-3 according to the invention can be manufactured by first cutting, more particularly sawing, the plate-like material from which they have to be realized, into panels and subsequently providing coupling parts at the respective sides or edges by means of cutting tools. To this end, the coupling parts at two opposite sides are preferably realized in a first machining cycle, whereas the coupling parts at the remaining opposite sides are realized in a second machining cycle.

When realizing panels in which each pair of opposite sides is provided with complementary coupling parts, e.g. as in figure 1, according to a particular aspect of the present invention, the panels 2 as well as 3 are realized by means of the same cutting tools, whereby at least the following steps are applied:

- displacing the panels of both series along a first set of tools for forming a first pair of complementary coupling parts at two opposite sides;
- displacing the panels of both series along a second set of tools for forming the second pair of complementary coupling parts at the two remaining opposite sides;
- when transferring the panels 2 of the first series of panels from the first to the second set of tools, subjecting them to a rotation such that

they finally end up in a rotational position in which they are turned in one direction; and

- when transferring the panels 3 of the second series of panels from the first to the second set of tools, subjecting them to a rotation such that they finally end up in a position in which they are turned in another direction than the panels of the first series.

Preferably, the panels 2 of the first series are turned over an angle of 90 degrees in one direction, whereas the panels 3 of the second series are turned over an angle of 90 degrees in the other direction. In this way, it is possible to first guide all panels through the first set of tools to form the coupling parts at the long sides, and subsequently turn half of the number of panels over 90 degrees to the right and half of the number of panels over 90 degrees to the left, before guiding them through the second set of tools. In other words, there is no straight movement of any of the panels in which the panels from the conveyor by which they are guided through the first set of tools are disposed directly on a sideward moving second conveyer, as for example known from WO 03/025307.

The above-explained method is schematically illustrated in figure 18 in which the first and second sets of tools are respectively indicated by reference numerals 32 and 33.

An advantage of this method consists in that there is no need of turning any of the panels over half a turn, and that the required rotational movements can be equally

divided over both series of panels. In this manner a more regular process can be guaranteed.

In the most preferred embodiment, the rotation of the panels is done by means of a robot. However guiding means which automatically urge the panels 2 and 3 in the right position can also be used.

The panels 2-3 having coupling parts which are arranged around the periphery in a manner as shown in figures 14 and 15, may be realized, according to the invention, by using three sets of tools, whereby a first set of tools is used for providing the panels 2-3 of both series with complementary coupling parts at one pair of opposite sides, whereby a second set of tools is used for realizing non-complementary coupling parts at the remaining opposite sides of the panels 2 of the first series, and a third set of tools is used for realizing non-complementary coupling parts at the remaining opposite sides of the panels 3 of the second series. Hereby, the sequence of guiding the panels through the respective sets of tools can be chosen at will.

The second and third set of tools can be arranged along different conveyor lines, whereby the panels for forming the first series of panels 2 run along the first conveyor line, whereas the panels for forming the second series of panels 3 run along the second conveyor line. This is schematically represented in figure 19, for the panels of figure 14, in which the first, second and third set of tools are indicated with reference numerals 34, 35 and 36.

However, alternatives are not excluded. According to an advantageous alternative, the second and third set of tools are arranged along a common conveyor line and the respective tools are retractable, such that dependent on which panel 2 or 3 has to be realized, the set of tools concerned can be brought into contact with the panel material.

Preferably, panels 2 of the first series and panels 3 of the second series are manufactured in such a manner that at the end of the manufacturing process, they are presented in an alternating manner before being packaged.

According to a further particular aspect of the invention, the panels of both series are packaged in a mixed manner, whereby preferably each package, more particularly box, comprises a same number of panels 2 as panels 3. Contrary to systems in which the panels 2-3 of both series are packaged in separate boxes, this offers several advantages. On the one hand, the storage and handling of the panels is facilitated, as all packages have the same content. On the other hand, for the same reason, the customers automatically receive panels of the one series and of the other series in the correct ratio.

The present invention is in no way limited to the forms of embodiment described as an example and represented in the figures, however, such floor covering, as well as the floor panels applied therewith, can be realized according to different variants, without leaving the scope of the invention.